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Gas cylinders — Gases and gas mixtures — Determination of tissue corrosiveness for the selection of cylinder valve outlets

Bouteilles à gaz — Gaz et mélanges de gaz — Détermination de la corrosivité sur les tissus pour le choix des raccords de sortie de robinets

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

This second edition cancels and replaces the first edition (ISO 13338:1995), which has been technically revised with the following change:

— Clauses 3, 4 and 5 have been updated.

Introduction

ISO 5145 specifies the dimensions of different valve outlets for different compatible gas groups. These compatible gas groups are determined according to practical criteria defined in ISO 14456.

These criteria are based on certain physical, chemical, toxic and corrosive properties of the gases. In particular, the tissue corrosiveness is considered in this document.

The aim of this document is to assign a classification category for each gas that takes into account the corrosiveness for skin, eyes and the respiratory tract of the gas.

For gas mixtures containing corrosive components, a calculation method based on the additivity method of the GHS is proposed.

However, for gas mixtures containing corrosive gas components, some valve outlets standards require the use of the corrosive category regardless of the corrosive gas concentration.

Gas cylinders — Gases and gas mixtures — Determination of tissue corrosiveness for the selection of cylinder valve outlets

1 Scope

This document provides:

— for pure gases and some liquids, a complete list indicating their corrosiveness;

— for gas mixtures, a calculation method, in the absence of experimental data, relating to the corrosiveness of each of their components;

in order to determine the corrosiveness of gases and gas mixtures on tissue so that a suitable outlet connection can be assigned to each of them.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
tissue corrosiveness of gases or gas mixtures
ability of a gas to damage or destroy living tissues (eyes, skin and mucous membranes)

Note 1 to entry: It corresponds to GHS hazard category skin corrosion 1, 1A, 1B or 1C or GHS hazard category eye damage 1.

3.1.2
irritant gas
gas which may cause a temporary reaction to the skin, eyes and mucous membranes

Note 1 to entry: It corresponds to GHS hazard category skin irritation 2 or GHS hazard category eye irritation 2.

Note 2 to entry: An irritant gas is regarded for the purposes of ISO 14456 as non-corrosive.

3.2 Symbols

L	limit
V	volume
C	indicates a corrosive component
i	indicates an irritant component
nc	indicates a non-corrosive, non-irritant component

4 Classification

ln accordance with the above, gases and gas mixtures are classified into the following categories:

— C: corrosive;

— i: irritant;

— nc: non-corrosive, non-irritant.

For a complete definition for purposes of the gas cylinder connection, the subdivisions of the FTSC code given in the notes to of Table 1 shall also be taken into account:

— 0: non-corrosive (nc or i);

— 1: forms non-halogen acids (C);

— 2: basic (C);

— 3: forms halogen acids (C).

5 Categories of corrosiveness for pure gases

The corrosiveness category of each gas (C, i or nc) corresponding to the classification defined in Clause 3 is shown in Table 1.

Table 1 — Corrosiveness categories of pure gases

Gas/liquid name	Chemical formula	Synonym	C Code[b]	Corrosiveness category
Ammonia[a]	NH_3	R717	2	C
Antimony pentafluoride[a]	SbF_5		3	C
Arsine	AsH_3		0	nc
Bis-trifluoromethylperoxide	$(CF_3)_2O_2$		0	nc
Boron trichloride	BCl_3	Boron chloride	3	C
Boron trifluoride	BF_3	Boron fluoride	3	C
Bromine pentafluoride[a]	BrF_5		3	C
Bromine trifluoride[a]	BrF_3		3	C
Bromoacetone[a]	CH_3COCH_2Br		3	C
1,3-Butadiene, stabilized	$CH_2 = CH\text{-}CH = CH_2$		0	nc
Carbon monoxide	CO		0	nc
Carbonyl sulfide	COS	Carbonoxylsulfide	1	C
Carbonyl fluoride	CF_2O		3	C
Chlorine	Cl_2		3	C
Chlorine pentafluoride	ClF_5		3	C
Chlorine trifluoride	ClF_3		3	C
Chloromethane	CH_3Cl	Methyl chloride R40	0	nc
Chlorotrifluoroethylene, stabilized	C_2ClF_3		0	nc
Cyanogen	$(CN)_2$		0	i
Cyanogen chloride	ClCN		3	C
Cyclopropane	C_3H_6	Trimethylene	0	nc
Deuterium chloride	DCl		3	C
Deuterium fluoride	DF		3	C
Deuterium selenide	D_2Se		1	i
Deuterium sulfide	D_2S		1	i
Diborane	B_2H_6		0	nc
Dibromodifluoromethane[a]	CBr_2F_2	R12B2	0	nc

NOTES

Description of each group:

Group 4: non-flammable, toxic and corrosive or corrosive by hydrolysis;

Group 7: basic, flammable and corrosive;

Group 8: flammable, toxic and corrosive (acid) or non-corrosive;

Group 9: spontaneously flammable;

Group 12: oxidizing, toxic and corrosive;

Group 13: flammable, subject to decomposition.

Key FTSC (ISO 14456**)**

0 = non-corrosive

1 = forms non-halogenated acids

2 = basic

3 = forms halogenated acids

[a] Some products, being liquid at normal ambient conditions, are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressure container.

[b] This category may be conservative.

Table 1 *(continued)*

Gas/liquid name	Chemical formula	Synonym	C Code[b]	Corrosiveness category
Dichlorosilane	SiH_2Cl_2		3	C
Diethylzinc[a]	$(C_2H_5)_2Zn$		0	nc
Dimethylamine	$(CH_3)_2NH$		2	C
Dimethylsilane	$(CH_3)_2SiH_2$		0	nc
Diphosgene[a]	$C_2O_2Cl_4$		3	C
Ethyldichloroarsine[a]	$C_2H_5AsCl_2$		3	C
Ethylene oxide	C_2H_4O	Oxirane	0	i
Fluorine	F_2		3	C
Fluoroethane	C_2H_5F	Ethyl fluoride	0	nc
Germane	GeH_4		0	nc
Heptafluorobutyronitrile[a]	C_3F_7N		0	nc
Hexafluoroacetone	C_3F_6O	Perfluoroacetone	3	C
Hexafluorocyclobutene	C_4F_6		0	nc
Hydrogen bromide	HB_r	Hydrobromic acid (anhydrous)	3	C
Hydrogen chloride	HCl	Hydrochloric acid (anhydrous)	3	C
Hydrogen cyanide	HCN	Hydrocyanic acid (anhydrous)	1	i
Hydrogen fluoride[a]	HF	Hydrofluoric acid (anhydrous)	3	C
Hydrogen iodide	Hl	Hydroiodic acid (anhydrous)	3	C
Hydrogen selenide	H_2Se		1	i
Hydrogen sulfide	H_2S		1	i
Iodine pentafluoride[a]	IF_5		3	C
Iodotrifluoromethane	CF_3I	Trifluoromethyl iodide	0	nc
Methyl bromide	CH_3Br	Bromomethane	0	i

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[b] This category may be conservative.

Table 1 *(continued)*

Gas/liquid name	Chemical formula	Synonym	C Code[b]	Corrosiveness category
Methyl mercaptan	CH3SH	Methanethiol	1	i
Methyl vinyl ether (inhibited)	C3H6O	Methoxyethylene	0	nc
Methyldichloroarsine[a]	CH3AsCI2		3	C
Methylsilane	CH_3SiH_3		0	nc
Monoethylamine[a]	$C_2H_5NH_2$	Ethylamine R631	2	C
Monomethylamine	CH_3NH_2	Methylamine R630	2	C
Nickel carbonyl[a]	$Ni(CO)_4$	Nickel tetracarbonyl	0	nc
Nitric oxide	NO	Nitrogen oxide	1	C
Nitrogen dioxide	NO_2	Nitrogen(IV) oxide	1	C
Nitrogen trifluoride	NF_3		0	i
Nitrogen trioxide	N_2O_3	Nitrogen sesquioxide	1	C
Nitrosyl chloride	NOCI		3	C
Oxygen difluoride	F_2O		3	C
Ozone (note: “not filled into cylinders”)	O_3		0	i
Pentaborane[a]	B_5H_{10}		0	nc
Pentafluoropropionitrile	C_3F_5N		0	nc
Perfluoro-2-butene	C_4F_8		0	nc
Phenylcarbylamine chloride[a]	$C_6H_5NCCI_2$		3	C
Phosgene	$COCI_2$	Carbonyl chloride	3	C
Phosphine	PH_3		0	nc
Phosphorus pentafluoride	PF_5		3	C
Phosphorus trifluoride	PF_3		3	C
Propylene oxide	C3H5O	Methyl oxirane	0	i
Silane	SiH4	Silicon tetrahydride	0	nc
Silicon tetrachloride[a]	SiCl4		3	c
Silicon tetrafluoride	SiF4	Tetrafluorosilane R764	3	C

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[b] This category may be conservative.

Table 1 *(continued)*

Gas/liquid name	Chemical formula	Synonym	C Code[b]	Corrosiveness category
Stibine	SbH3	Antimony hydride	0	nc
Sulfur dioxide	SO2		1	C
Sulfur tetrafluoride	SF4		3	C
Sulfuryl fluoride	SO2F2		0	nc
Tetraethyl lead[a]	(C2H5)4Pb		0	nc
Tetrafluorohydrazine	N2F4		3	C
Tetramethyllead	(CH3)4Pb		0	nc
Triethyl aluminium[a]	(C2H5)3AI		0	nc
Triethyl borane	(C2H5)3B		0	nc
Trifluoroacetonitrile[a]	C2F3N		0	C
Trifluoroethylene	C2HF3		0	nc
Trimethylamine	(CH3)3N		2	C
Trimethylsilane	$(CH_3)_3SiH$		0	nc
Trimethylstibine[a]	$(CH_3)_3Sb$		0	nc
Tungsten hexafluoride	WF_6		3	C
Uranium hexafluoride	UF_6		3	C
Vinyl bromide (inhibited)	C_2H_3Br		0	nc
Vinyl chloride (inhibited)	C_2H_3CI	Chloroethylene R1140	0	nc
Vinyl fluoride (inhibited)	C_2H_3F	Fuloroethylene R1141	0	nc

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